

Work Posture Assessment with Application (Quick Exposure Check) at Boiler Stations

Ikhsan Siregar¹, Ridhaul Fuad², Yusuf Hanifah³

^{1,2,3} Department of Industrial Engineering, University of Sumatera Utara, Indonesia

ikhsan.siregar@usu.ac.id

Siregar_ix@yahoo.com

The.snake.diver@gmail.com

Abstract— This research is in farm manufacturing. The manufacturing is less aspect health and occupational safety (K3) for each worker, especially in the boiler workers. Element works at the boiler station the disposal of burning done manually and repeatedly. Activity manual work done this repeating if done in long period of time, will cause injured ‘musculoskeletal’ which led to declines in productivity company. It needs to be an assessment of posture work at the station boiler so as not to cause risk injured. The method used to assess the relative posture work is the method quick exposure check (QEC). QEC is a method of assessment using a questionnaire as an instrument to analyze posture work perceived workers for does its work. The research results show that the score exposure from workers at the station boiler high, so that need to be taken of action investigation and improved soon as soon as possible. The score exposure workers Operator 1 is 67,04 %, workers Operator 2 is 69,31 % and Operator 3 is 64,77 %

Keywords— Musculoskeletal, Work Posture, Quick Exposure Check (QEC), Operator, occupational safety.

I. INTRODUCTION

Increase the productivity is an important effort that a company should do in order to survive and to develop the business. One of the things that support employee productivity is the ergonomic aspects. The main factors in the work system based on ergonomic aspects are human. This principle is called human centered design, human as a planner, planning, executing, controlling, and evaluators the whole working system in order to obtain a good work.

There are many research on working postures had been done in many places of the world. This research is endless; this is because the amount of equipment and working methods are wrong in doing his job. This is very harmful to the operator while working. In a previous study, in the Malaysian state electronics company in researching about the pain behind the workers, the conclusion obtained that companies should review and provide a schedule extra rest for workers [1]. Other studies

on worker posture while standing, standing where necessary tools to prevent injury [2]. The case study on nurses in hospitals in the United States that are common injuries in nurses when carrying out the work, it is clearly stated that all the work had nearly the same risk [3]. Human posture who suffered injury not only in adults, but can also afflicts children [4]. There is even a study that examines the tattoo artist to work posture when carrying out work [5]. Several studies before were conducted outside Indonesia, while research in Indonesia is researching on muscle injury when carrying out the work of Stamping Batik (*Batik Cap*) [6]. Another study conducted in Indonesia is like the research about operators using manual material handling, which found many workers who feel sick at the time after doing the work [7].

To use methods Quick Exposure Check (QEC), previous research studies conducted about the taxi drivers in Turkey, through the study found that the taxi drivers prone to injury when doing work [8].

The research looked at posture assessment workers in the boiler workstation; it is because of the many complaints from workers at that workstation. Assessment of the risk of musculoskeletal workers at Sei Semayang Sugar Factory boiler station is based on work that performed by circumstances that can cause injury. Non-ergonomic working postures in the boiler station for long periods of time have a higher risk of musculoskeletal. Through this research is expected a solution for Operator to feel comfort working at his job.

II. METHOD

The object of this research is the workers who perform work in the boiler stations with poor

environmental conditions. Workers who observed in this study is as many as three people. Schematically, the steps of the study can be seen in Fig. 1.

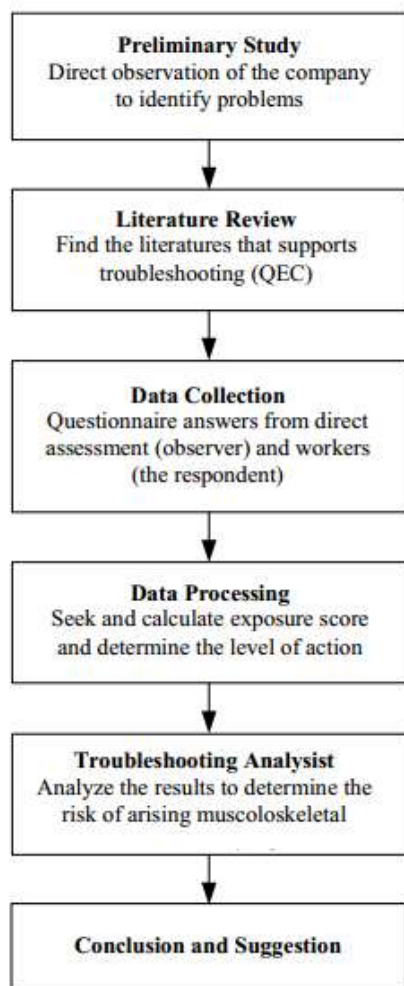


Fig. 1. Research Method Block Diagram

Steps being taken in the study

1. Preliminary Study

Preliminary study was conducted to determine the working conditions of the company to be used as the basic framework of thinking for analyzing the problems to be studied.

2. Literature Review

The study of literature are theories that are used in problem solving. Study of literature as the basis for logical thinking in solving the problem scientifically.

3. Data Collection

The data taken is the primary data, is the data obtained from direct observations and research in the field. Data taken form the QEC questionnaire answers from direct assessment (observer) and workers (respondent).

4. Data Processing

Data already collected and processed by the method of QEC (Quick Exposure Check). In this case, assessed and calculated exposure scores of each working element then will be presented to get the level of action to be taken in the risk of musculoskeletal experienced workers.

5. Troubleshooting Analyst

Based on the results obtained from the data processing, do the troubleshooting analyst. The analysis was performed in order to see whether the method used has been able to identify musculoskeletal risk so do the proposed improvement.

6. Conclusion and Recommendations

Based on data processing and discussion it can be concluded about the studied problems and provide suggestions for improvement in the future related research.

III. RESULTS AND DISCUSSIONS

QEC questionnaire given to all workers at the boiler work station and observers also assess how the worker's body posture when working. QEC questionnaire for observers and workers are different, but both are used to analyze the condition of a work station. Questionnaires of observers pay more attention to the body posture during activity. While the workers questionnaire lead to the perceived felt by workers while doing his job.

Nama Pekerja: Anji H.		Pilihan	Pengisian Pekerjaan	Pilihan
A. Ketika melakukan pekerjaan, punggungnya			B. Berat maksimum yang diangkat secara manual dalam pekerjaan ini	
A1 Tangan teral		B1 Tangan (5 kg atau kurang)		
A2 C atau bengkak	A2	B2 Sedang 16 hingga 10 kg		
A3 Sengal bengkak		B3 Berat (11 hingga 20 kg)		
B. Pilih salah satu kegiatan berikut:			B4 Sangat berat (lebih dari 20 kg)	B4
Untuk pekerjaan di atas berilah apakah punggung keberyuan dalam keadaan ini			C. Rata-rata berapa lama waktu yang dibutuhkan untuk pekerjaan ini	
B1 Tidak		C1 Kurang dari 2 jam		C1
B2 Ya		C2 2 hingga 4 jam		
Untuk pekerjaan mengangkat, memutar, mendorong/besar, pekerjaan punggung			C3 Lebih dari 4 jam	
B3 Tidak sering (sekali 3 kali per menit atau kurang)		D. Ketika melakukan pekerjaan ini dengan satu tangan, berat maksimum yang diangkat		
B4 Sering (sekali 5 kali per menit)	B4	D1 Berat (kurang dari 1 kg)		
B5 Sangat sering (sekali 12 kali per menit atau lebih)		D2 Sedang 13 hingga 4 kg		
C. Ketika melakukan pekerjaan, apakah tangan			D3 Lebih dari 4 kg	D3
C1 Pada atau di bawah pinggang	C1	E. Apakah perlu pengalasan dalam pekerjaan ini?		
C2 Sekitar dada		E1 Tidak (hanya tidak ada untuk situasi ini)		E1
C3 Pada atau di atas bahu		E2 Tidak (memerlukan dari pada beberapa kali)		
D. Apakah pekerjaan ini berbahaya atau			M. Apa saja masalah kesehatan lainnya	
D1 Tidak sering (beberapa kali seminggu)		M1 Kurang dari 1 jam per hari		M1
D2 Sering (setidaknya 1 kali dalam beberapa minggu)		M2 Antara 1 dan 4 jam per hari		
D3 Sangat sering (setidaknya 1 kali seminggu)	D3	M3 Lebih dari 4 jam per hari		
E. Apakah pekerjaan dilakukan dengan			N. Apa saja masalah kesehatan lainnya	
E1 Pergerakan tangan yang banyak, berat		N1 Kurang dari 1 jam per hari		N1
E2 Pergerakan tangan yang ditanggung	E2	N2 Antara 1 dan 4 jam per hari		
E3 Tidak ada gerakan yang sama dilakukan		P. Apakah ada kesulitan dalam pekerjaan ini?		
F1 10 kali per menit atau kurang		P1 Tidak pernah		
F2 11 hingga 20 kali per menit	F2	P2 Kadang		P2
F3 lebih dari 20 kali per menit		P3 Sering		
G. Ketika melakukan kegiatan tersebut apakah beres/bekerja dengan atau beres?			Q. Secara umum, pekerjaan ini	
G1 Tidak		Q1 Tidak stress		
G2 Ya, kadang-kadang	G2	Q2 Sedikit stress		Q2
G3 Ya, terus-menerus		Q3 Cukup stress		
		Q4 Sangat stress		

Fig. 2. OEC (*Quick Exposure Check*) Questionnaire Data

TABLE I
OBSERVER QUESTIONNAIRE ANSWER RECAPITULATION

Name Worker	Back		Shoulder		Neck		Wrist
	1	2	1	2	1	2	
Anju H.	A2	B4	C1	D3	E2	F2	G2
Tandra	A2	B4	C2	D3	E2	F2	G2
Jogi T.	A2	B4	C1	D2	E2	F2	G2

TABLE II
WORKER ANSWER QUESTIONNAIRE RECAPITULATION

Workers' Name	Question							
	H	J	K	L	M	N	P	Q
Anju H.	H4	J1	K3	L1	M1	N1	P2	Q2
Tandra p.	H4	J1	K3	L1	M1	N1	P2	Q2
Jogi T.	H4	J1	K3	L1	M1	N1	P2	Q2

The answers obtained from the questionnaires will then be used to calculate the exposure value score. Example of the calculation are carried out on the QEC score sheet like shown at Figure 3.

Panggung				Rakus/Langan				Taman				Loker			
A dan B1				C dan H				F dan K				G dan I			
A1	A2	A3		C1	C2	C3		F1	F2	F3		G1	G2	G3	
H1	2	3	6	H1	2	4	6	K1	2	4	6	J1	2	4	
H2	4	6	8	H2	4	6	8	K2	4	6	8	J2	4	6	
H3	6	8	10	H3	6	8	10	K3	6	8	10	J3	6	8	
H4	8	10	12	H4	8	10	12								
Skor 1				Skor 3				Skor 1				Skor 1			
A dan J				C dan J				F dan J				G dan J			
A1	A2	A3		C1	C2	C3		F1	F2	F3		G1	G2	G3	
J1	2	4	6	J1	2	4	6	J2	4	6	8	J2	4	6	
J2	4	6	8	J2	4	6	8	J3	6	8	10	J3	6	8	
J3	6	8	10	J3	6	8	10								
Skor 2				Skor 2				Skor 2				Skor 2			
I dan H				I dan H				I dan K				Total			
H1	2	4	6	H1	2	4	6	K1	2	4	6				
H2	4	6	8	H2	4	6	8	K2	4	6	8				
H3	6	8	10	H3	6	8	10	K3	6	8	10				
H4	8	10	12	H4	8	10	12								
Skor 3				Skor 3				Skor 3				Total			
J dan K				D dan H				E dan K				Total			
K1	2	4	6	H1	2	4	6	K1	2	4	6				
K2	4	6	8	H2	4	6	8	K2	4	6	8				
K3	6	8	10	H3	6	8	10	K3	6	8	10				
				H4	8	10	12								
Skor 3				Skor 4				Skor 4				Total			
B dan J				D dan J				E dan J				Total			
J1	2	4	6	J1	2	4	6	J1	2	4	6				
J2	4	6	8	J2	4	6	8	J2	4	6	8				
J3	6	8	10	J3	6	8	10	J3	6	8	10				
				J4	8	10	12								
Skor 4				Skor 4				Skor 4				Total			
B dan H				D dan J				E dan J				Total			
H1	2	4	6	J1	2	4	6	J1	2	4	6				
H2	4	6	8	J2	4	6	8	J2	4	6	8				
H3	6	8	10	J3	6	8	10	J3	6	8	10				
H4	8	10	12	J4	8	10	12								
Skor 5				Skor 5				Skor 5				Total			
B dan J				D dan J				E dan J				Total			
J1	2	4	6	J1	2	4	6	J1	2	4	6				
J2	4	6	8	J2	4	6	8	J2	4	6	8				
J3	6	8	10	J3	6	8	10	J3	6	8	10				
				J4	8	10	12								
Skor 5				Skor 5				Skor 5				Total			
B dan H				D dan J				E dan J				Total			
H1	2	4	6	J1	2	4	6	J1	2	4	6				
H2	4	6	8	J2	4	6	8	J2	4	6	8				
H3	6	8	10	J3	6	8	10	J3	6	8	10				
H4	8	10	12	J4	8	10	12								
Skor 5				Skor 5				Skor 5				Total			
B dan J				D dan J				E dan J				Total			
J1	2	4	6	J1	2	4	6	J1	2	4	6				

Fig. 3. QEC Score Sheet

The results of exposure calculation will then be calculated by using the formula:

$$E(\%) = \frac{X - x}{X_{\max}} \times 100\% \quad (1)$$

X = The total scores obtained for the exposure to the risk of injury to the back, shoulders/arms, wrists and neck that obtained from questionnaires calculation

Xmax = The total maximum score for exposure that may occur injury to back, shoulder/arm, wrist and neck.

Xmax for static work is 162

Xmax for manual handling work 176

The following calculations of QEC assessment for worker Anju H.

$$\begin{aligned} X &= 36 + 36 + 30 + 6 + 1 + 1 + 4 + 4 = 118 \\ X_{\max} &= 176 \end{aligned}$$

The exposure score (E) is:

$$E = \frac{118}{176} \times 100 \% = 67,04 \%$$

Based on the assessment of the elements of the work of the combustion disposal in the boiler station, indicating that elements of the work at the station boilers require investigation and repair immediately. This is proved by the existence of

errors work posture (working posture is not good), causing back and shoulder/arm scores high. Thus, the risk of musculoskeletal for the worker is quite dangerous if it is continued without repairs.

Based on the results of the assessment by the QEC method showed that elements of the work at the station boilers require urgent repairs so that the risk of musculoskeletal experienced enough workers at risk. Improvements that can be proposed as a solution to the problem is to reduce the maximum weight lifted manually in this work.

TABLE III
EXPOSURE SCORE RECAPITULATION AND ACTIONS LEVEL

Name	Score (%)	Actions
Anju H.	67,04	Immediat investigation and refurbishment
Tandra P.	69,31	Immediat investigation and refurbishment
Jogi T.	64,77	Immediat investigation and refurbishment

IV. CONCLUSIONS

Based on the results of conducted research can be concluded:

1. Exposure Score causing musculoskeletal risk of workers at the station boiler for workers Anju H is 67.04%, workers Tandra P is 69.31% and workers Jogi T is 64.77%.
2. Level of action that should be taken to improve musculoskeletal risk is the immediate investigation and prompt repair.
3. The risk of musculoskeletal experienced by workers in the boiler station is high and quite dangerous. This musculoskeletal high risk assessment located at the back, shoulders/arms and hands. This is due to unfavorable working facilities.

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